

# **SIGNAL INPUT DEVICE**

## **BACKGROUND OF THE INVENTION**

### **1. Field of the Invention:**

The present invention relates to a signal input device and,  
5 more specifically, to a signal input device in which the conducting track unit is arranged on the shell by printing, eliminating the arrangement of conducting track unit bearing means.

### **2. Description of the Related Art:**

FIG. 1 illustrates a signal input device according to the  
10 prior art, which comprises a top cover 10a, a set of key buttons 20a, a set of rubber domes 31a, conductive contacts 40a, a printed circuit board 50a, a membrane circuit board 60a, and a bottom shell 70a. The top cover 10a has a plurality of through holes 11a. The key buttons 20a are axially and movably mounted in the through  
15 holes 11a. The conductive contacts 40a are respectively mounted in the rubber domes 31a on the bottom side. The printed circuit board 50a comprises an IC chip 51a. The top cover 10a, the membrane circuit board 60a and the bottom shell 70a are fastened together in proper order. The printed circuit board 50a is mounted in between  
20 the top cover 10a and the bottom shell 70a, and electrically connected to the membrane circuit board 60a. The rubber domes 31a are provided between the top cover 10a and the membrane circuit board 60a. The key buttons 20a are respectively aimed at

the rubber domes **31a**. The conductive contacts **40a** are respectively disposed in the rubber domes **31a** and facing the lead wires **61a** of the membrane circuit board **60a**. When pressing the key buttons **20a**, the corresponding rubber domes **31a** are depressed to force the  
5    respective conductive contacts **40a** into contact with the corresponding lead wires **61a** of the membrane circuit **60a**, thereby causing the IC chip **51a** to output a signal.

        This structure of signal input device has numerous drawbacks as follows:

- 10    1. The signal input device comprises many components, resulting in a complicated assembly process and high manufacturing cost.
2. The connection between the membrane circuit board and the printed circuit board requires a special manufacturing process, increasing the processing time of the signal input device.
- 15    3. A locating means must be provided in the top cover and bottom shell of the signal input device for the positioning of the printed circuit board and the membrane circuit board, increasing the material consumption and processing cost of the signal input device.

20          Therefore, it is desirable to provide a signal input device that eliminates the aforesaid drawbacks.

## **SUMMARY OF THE INVENTION**

        The present invention has been accomplished under the

circumstances in view. It is the main object of the present invention to provide a signal input device, which can be modularized to facilitate the fabrication and to reduce the manufacturing cost. It is another object of the present invention to provide a signal input  
5 device, which requires fewer components, thus reducing the material cost thereof. It is still another object of the present invention to provide a signal input device, which saves processing time and cost. According to a first embodiment of the present invention, the signal input device comprises a bottom shell, a  
10 printed conducting track unit arranged on a top surface of the bottom shell, the printed conducting track unit having a plurality of contact portions, and a top cover covering the bottom shell and carrying a press unit, the press unit being aimed at and spaced above the contact portions of the printed conducting track unit for  
15 pressing by the user to connect selectively the contact portions of the printed conducting track unit. According to a second embodiment of the present invention, the signal input device comprises a bottom shell, the bottom shell having a top surface, a plurality of conductive contacts mounted on the top surface of the  
20 bottom shell, a top cover covering the bottom shell, the top cover having a bottom surface and carrying a press unit, and a printed conducting track unit located on the bottom surface of the top cover, the printed conducting track unit comprising a plurality of contact

portions respectively aimed at the press unit and separated from the press unit by a distance. According to a third embodiment of the present invention, the signal input device comprises a bottom shell, the bottom shell having a top surface, a printed conducting track unit located on the top surface of the bottom shell, the printed conducting track unit comprising a plurality of contact portions, a top cover covering the bottom shell, the top cover carrying a press unit, a plurality of rubber domes provided between the top cover and the bottom shell corresponding to the contact portions of the printed conducting track unit, and a plurality of conductive contacts respectively mounted in the rubber domes on a bottom side and facing the contact portions of the printed conducting track unit.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

The accompanying drawings are included to provide a further understanding of the invention, and are incorporated in and constitute a part of this specification. The drawings illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention. In the drawings,

FIG. 1 is an exploded view of the prior art design;

FIG. 2 is an exploded view of a first embodiment of the present invention;

FIG. 3 is an enlarged, cross-sectional assembly view of a

part of FIG. 2;

FIG. 4 is an enlarged, exploded view of the printed conducting track unit according to the first embodiment of the present invention;

5           FIG. 5 is a cross-sectional view of a second embodiment of the present invention;

FIG. 6 is a cross-sectional view of a third embodiment of the present invention;

FIG. 7 is an exploded view of a computer keyboard  
10   constructed according to the present invention; and

FIG. 8 is an enlarged, cross-sectional assembly view of a part of the computer keyboard shown in FIG. 7.

#### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT**

Referring to FIGS. 2 and 3, a signal input device is shown  
15   comprising a bottom shell 10, a printed conducting track unit 20, and a top cover 30. The printed conducting track unit 20 is formed on the top surface of the bottom shell 10. The top cover 30 comprises a press unit 40. Pressing the press unit 40 connects a part of the printed conducting track unit 20 to produce a corresponding  
20   input signal.

Referring to FIG. 4 and FIG. 2 again, the bottom shell 10 can be an electrically insulating body molded from polymers. Alternatively, the bottom shell 10 can be made having an

electrically insulating top surface. The conducting track unit **20** is a multilayer conducting track unit formed on the top surface of the bottom shell **10** by screen-printing. The formation of the printed conducting track unit **20** includes the steps of: (a) screen-printing a  
5 layer of conducting glue, for example, silver glue **21** on the top surface of the bottom shell **10**, which layer of silver glue **21** includes contact portions **22**, lead wires **23** and conducting portions **24**; (b) screen-printing an insulating layer **25** on the top surface of the bottom shell **10** over the lead wires **23** beyond the contact  
10 portions **22** and the conducting portions **24**; and (c) pain-coating a layer of conducting film, for example, carbon film **26** on the insulating layer **25** over the conducting portions **24** to electrically connect the conducting portions **24**.

Referring to FIGS. 2 and 3 again, the top cover **30** covers  
15 the bottom shell **10** to carry the press unit **40**, having a plurality of through holes **31**. The press unit **40** is axially and movably mounted in the through holes **31**. A set of rubber domes **51** is provided between the press unit **40** and the printed conducting track unit **20**, having conductive contacts **60** respectively mounted in the rubber  
20 domes **51** corresponding to and spaced above the contact portions **22** of the printed conducting track unit **20**. An IC chip **70** is installed on the top surface of the bottom shell **10**, having contact pins **71** electrically connected to the printed conducting track unit

20 by SMD or wire binding. Therefore, pressing the press unit 40 causes the rubber domes 51 to selectively force the conductive contacts 60 into contact with the corresponding contact portions 22 of the conducting track unit 20, thereby driving the IC chip 70 to  
5 output a signal.

FIG. 5 is a cross-sectional view of a second embodiment of the present invention. According to this embodiment, the press unit 40 is formed in the top cover 30. The press unit 40 can be made flush with the top surface of the top cover 30. Alternatively, the  
10 press unit 40 can be made having a top side protruding from the top surface of the top cover 30. Further, the press unit 40 has recessed portions 41 in the bottom side of each button thereof. The bottom shell 10 has a conducting track unit 20 printed on the top surface and an IC chip 70 installed on the top surface and electrically  
15 connected to the lead wires 23 of the printed conducting track unit 20. The top cover 30 covers the bottom shell 10. The conductive contacts 60 are respectively located on the bottom side of each button of the press unit 40. The conductive contacts 60 can be a conducting film, for example, carbon film respectively plated on  
20 the bottom side of each button of the press unit 40 corresponding to the contact portions 22 of the printed conducting track unit 20. Therefore, pressing the press unit 40 causes the conductive contacts 60 to contact the corresponding contact portions 22 of the

printed conducting track unit **20**, thereby driving the IC chip **70** to output a signal. This embodiment further comprises a light emitting device, for example, LED (light emitting diode) **80** installed on the top surface of the bottom shell **10** and electrically connected to the lead wires **23** of the printed conducting track unit **20** by SMD. The top cover **30** has through holes **32**. A light guide **90** is mounted on the bottom side of the top cover **30** and extended to the inside of one through hole **32** to guide the light of the LED **80**. An electric connector **85** is mounted in the bottom shell **20** and electrically connected to the lead wires **23** of the printed conducting track unit **20**, having a receiving side positioned in one through hole **32** of the top cover **30** for receiving an external electronic device.

FIG. 6 is a cross-sectional view of a third embodiment of the present invention. According to this embodiment, the top cover **30** is an electrically insulating shell molded from, for example, copolymers. The conducting track unit **20** is printed on the electrically insulating bottom surface of the top cover **30**. The electrically insulating bottom surface of the top cover **30** is preferably a planar surface. The press unit **40** is carried on the top cover **30** corresponding to the contact portions **22** of the conducting track unit **20**. The IC chip **70** is bonded to the bottom surface of the top cover **30**, and electrically connected to the lead wires **23** of the conducting track unit **20**. The conductive contacts **60** are located on

the top surface of the bottom shell 10. When the top cover 30 covers the bottom shell 20, the conductive contacts 60 are respectively aimed at the contact portions 22 of the conducting track unit 20. Further, the top cover 30 has recessed portions  
5 corresponding to the buttons of the press unit 40. Therefore, pressing the press unit 40 cause the press unit 40 to deform slightly and to further force the conductive contacts 60 into contact with the corresponding contact portions 22 of the conducting track unit 20, thereby driving the IC chip 70 to output a signal. When the external  
10 force is released from the press unit 40, the top cover 30 returns to its former shape. This embodiment further comprises support means 100 provided between the top cover 30 and the bottom shell 10 to ensure the presence of a gap between the conductive contacts 60 and the contact portions 22 of the conducting track unit 20.

15 Referring to FIGS. 2, 3, 5 and 6 again, the top cover 30 has through holes 32, and the light emitting device 80 is electrically connected to the printed conducting track unit 20 in the top cover 30 and aimed at or inserted into one through hole 32. As indicated, the light emitting device 80 can be a LED. The top cover 30 has two  
20 bottom engagement portions 110 symmetrically disposed on the left and right sides. The bottom shell 10 has two top engagement portions 120 symmetrically disposed on the left and right sides and adapted to engage the bottom engagement portions 110 of the top

cover 30. According to the present invention, the bottom engagement portions 110 are retaining grooves, and the top engagement portions 120 are retaining ribs fitting the retaining grooves of the bottom engagement portions 110. The bottoms hell  
5 10 further comprises a plurality of upright bonding portion 130 bonded to the top cover 30.

Referring to FIGS. 7 and 8, the signal input device can be a computer keyboard comprising a bottom shell 10, a printed conducting track unit 20, a top cover 30, rubber domes 51, and  
10 conductive contacts 60. The printed conducting track unit 20 is located on the top surface of the bottom shell 10, comprising a plurality of contact portions 22. The top cover 30 covers the bottom shell 10 to carry the press unit 40. The rubber domes 51 are provided between the top cover 30 and the bottom shell 10  
15 corresponding to the contact portions 22 of the printed conducting track unit 20. The conductive contacts 60 are respectively installed in the rubber domes 51 at the bottom side corresponding to the contact portions 22 of the printed conducting track unit 20.

As indicated above, the signal input device has advantages  
20 as follows:

1. It can be modularized to ease the fabrication and reduce the manufacturing cost.
2. It requires fewer components, thus reducing material cost.

3. It eliminates many assembly and connection procedures, thereby saving much labor and time.

A prototype of signal input device has been constructed with the features of FIGS. 2-8. The signal input device functions  
5 smoothly to provide all of the features discussed earlier.

Although particular embodiments of the invention have been described in detail for purposes of illustration, various modifications and enhancements may be made without departing from the spirit and scope of the invention. Accordingly, the  
10 invention is not to be limited except as by the appended claims.